

Remarks/Arguments:**I. Status**

The Office Action dated February 24, 2005 (the "Office Action") has been carefully reviewed. The Examiner has rejected claims 1, 3, 5-8, 12, 14 and 21. Claims 9-11, 13 and 15-17 were objected to.

Claims 1, 3, 12 and 21 have been amended. Claim 5 has been canceled. New claims 22-26 have been added. Therefore, claims 1, 3, 6-17 and 21-26 remain in the application. The Applicant respectfully requests reconsideration of claims 1, 3, 6-17 and 21-26 in view of the foregoing amendments and the following arguments.

II. 35 U.S.C. § 102 Rejections.

Claims 1, 3 and 12 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,934,980 to Koos et al. ("Koos"). Claim 3 depends from claim 1 and claims 1 and 12 have been amended to clarify that a "nonaqueous liquid" comprising a nonaqueous solvent is used to rinse a semiconductor wafer in those claims. Koos does not teach or suggest this limitation.

Discussion re: Claim 1

Specifically, claim 1, as amended, recites "disposing a volume of nonaqueous liquid including a nonaqueous solvent onto said semiconductor wafer to rinse the semiconductor wafer". The Examiner has alleged that the second diluting solution of Koos is the same as the recited nonaqueous solvent citing to Koos at column 7, lines 8-14. (Office Action at page 4). The Applicant respectfully notes that the description of

the composition of the second diluting solution that the Examiner has referenced is at column 8, lines 11-14 of Koos. There, Koos states that as an alternative to deionized water, the “second diluting *solution* comprises a solvent, such as, for example, acetone or alcohol.” (Koos at column 8, lines 12-13, emphasis added). The *Random House College Dictionary*, revised ed. (1975), defines “solution” as “a homogenous, molecular mixture of two or more substances”. Therefore, the teaching of Koos relied upon by the Examiner is of a mixture of *two* substances. Koos clearly identifies *one* of the substances. Koos contains *no* discussion, however, of what the remaining substance(s) in the solutions might be. More significantly, Koos does not state that the acetone or alcohol is used in a nonaqueous diluting solution.

Accordingly, since it is well known to use acetone and alcohol in aqueous solutions and the use of the term “solution” denotes at least two substances in the diluting solution only one of which is identified, Koos does not teach disposing a nonaqueous solvent onto a semiconductor wafer in a nonaqueous liquid as recited in claims 1. In fact, the two buffering solutions (which Koos equates with diluting solutions, see e.g. Koos at column 7, lines 1-4) for which Koos identifies more than one of the constituent substances are both aqueous solutions. (See Koos at column 6 lines 54-57 and 63-67).

For the foregoing reasons, it is respectfully submitted that Koos fails to teach, disclose or suggest all of the elements of claim 1. As a consequence, Koos does not anticipate claim 1 and the rejection of claim 1 under 35 U.S.C. § 102 should be withdrawn.

Discussion re: Claim 3

Claim 3 depends from claim 1 and incorporates the limitations of claim 1.

Therefore, for at least the same reason set forth above with respect to claim 1, it is respectfully submitted that Koos fails to teach, disclose or suggest all of the elements of claim 3. As a consequence, the anticipation rejection of claim 3 should be withdrawn.

Discussion re: Claim 12

Claim 12, as amended, recites “disposing, a volume of nonaqueous liquid including a nonaqueous solvent onto said front side of said semiconductor wafer”. For purposes of this discussion, this is the same limitation discussed above with respect to claim 1. Therefore, for at least the same reason set forth above with respect to claim 1, it is respectfully submitted that Koos fails to teach, disclose or suggest all of the elements of claim 12. As a consequence, the anticipation rejection of claim 12 should be withdrawn.

III. 35 U.S.C. § 103 Rejections.

The Examiner as rejected claims 5, 6, 7, 8, 14 and 21 under 35 U.S.C. § 103 as being obvious over Koos in view of additional art. The Applicant respectfully requests reconsideration.

Discussion re: Claim 7

1. Claim 7 Depends From Claim 1

As an initial matter, claim 7 has been rejected based primarily upon Koos with additional reference to U.S. Patent No. 6,436,830 to Merchant et al. (“Merchant”) solely for the teaching of an ammine. (Office Action at page 5). Claim 7 depends from claim 1 and includes the limitation of a nonaqueous liquid including a nonaqueous solvent. As discussed above with respect to claim 1, Koos does not teach or suggest such a limitation. Accordingly, even modifying Koos to include an ammine solvent does not arrive at the invention of claim 7. Therefore, it is respectfully submitted that claim 7 is patentable over the cited prior art.

2. There is No Motivation For the Proposed Combination

The Examiner alleges a motivation for the above combination because modifying “Koos’ polishing composition by including a nonaqueous solvent such as amine” would capture metal particles. (Office Action at pages 5-6). As set forth above, however, the Examiner has relied upon the “*diluting* solution” as the nonaqueous liquid, not the polishing composition. Accordingly, even assuming *arguendo* that Koos teaches a *nonaqueous* diluting solution, and further assuming *arguendo* that there is a motivation to introduce an ammine into the *aqueous* polishing solution, the Examiner has failed to identify any logical link between the addition of ammine to an *aqueous polishing* solution and the additional step of adding the ammine to a *nonaqueous diluting* solution.

Accordingly, even if the allegations made by the Examiner are accepted, a motivation for the proposed modification has not been alleged. Therefore, under MPEP §

2143.03, the Examiner has failed to present a *prima facie* case of obviousness and the rejection of claim 7 under 35 U.S.C. 103(a) should be withdrawn.

3. Merchant Does Not Teach Use of Ammine in a Nonaqueous Liquid

Finally, claim 7, as amended, recites the use of ammine as a solvent in a *nonaqueous liquid*. Merchant clearly teaches the use of ammine in an *aqueous solution*. Specifically, the second emulsion of Merchant “preferably comprises an organic phase (ORG) 14 and a dispersed aqueous phase (AQ_I) 16”. (Merchant at column 3, lines 56-58). The use of the amine in an aqueous liquid is clearly shown in FIG. 1, wherein the slurry 10 includes both the organic phase 14 and the aqueous phase 16. Thus, the slurry 10 is an aqueous solution.

Therefore, because claim 7 recites the use of amine as a solvent in a *nonaqueous liquid* and because neither Koos nor Merchant teach or suggest such a limitation, all of the limitations of claim 7 are not taught or suggested in the prior art relied upon by the Examiner. Therefore, under MPEP § 2143.03, a *prima facie* case of obviousness has not been established and the rejection of claim 7 under 35 U.S.C. 103(a) should be withdrawn.

4. Conclusion

For any or all of the foregoing reasons, it is respectfully submitted that the rejection of claim 7 as being obvious over Koos in view of Merchant has been successfully traversed, and the Applicant respectfully submits that the rejection of claim 7 under 35 U.S.C. § 103 should be withdrawn.

Discussion re: Claim 8

1. Claim 8 Depends From Claim 1

As an initial matter, claim 8 has been rejected based primarily upon Koos with additional reference to U.S. Patent No. 5,780,358 to Zhou et al. (“Zhou”) solely for the teaching of a dimethylsulfoxide (DMSO). (Office Action at page 6). Claim 8 depends from claim 1 and includes the limitation of a nonaqueous liquid including a nonaqueous solvent. As discussed above with respect to claim 1, Koos does not teach or suggest such a limitation. Accordingly, even modifying Koos to include a DMSO solvent in the second diluting solution does not arrive at the invention of claim 8. Therefore, it is respectfully submitted that claim 8 is patentable over the cited prior art.

2. There is No Motivation For the Proposed Combination

The Examiner alleges a motivation for the above combination because modifying “Koos’ polishing slurry by including DMSO” would assist in rapid dissolution of copper metal. (Office Action at page 6). As set forth above, however, the Examiner has relied upon the “*diluting* solution” as the nonaqueous liquid, not the polishing composition. Accordingly, even assuming *arguendo* that Koos teaches a *nonaqueous* diluting solution, and further assuming *arguendo* that there is a motivation to introduce DMSO into the *aqueous* polishing solution as alleged, the Examiner has failed to identify any logical link between the addition of DMSO to an *aqueous polishing* solution and the additional step of adding the DMSO to a *nonaqueous diluting* solution.

Accordingly, even if the allegations made by the Examiner are true, a motivation for the proposed modification has not been alleged. Therefore, under MPEP § 2143.03, the Examiner has failed to present a *prima facie* case of obviousness and the rejection of claim 8 under 35 U.S.C. 103(a) should be withdrawn.

3. Zhou Does Not Teach Use of DMSO in a Nonaqueous Rinsing Liquid

Finally, claim 8, as amended, recites the use of DMSO as a solvent in a nonaqueous liquid that is used “*to rinse* the semiconductor wafer” (see claim 1, emphasis added). Zhou clearly teaches the use of DMSO in a *slurry solution*. Specifically, the slurry of Zhou includes an abrasive powder. (Zhou at column 8, lines 40-44). A slurry solution with abrasive particles used to planarize a semiconductor wafer surface is not the same as a liquid used to rinse the semiconductor wafer surface.

Therefore, because claim 8 recites the use of DMSO as a solvent in a nonaqueous liquid that is used “*to rinse* the semiconductor wafer” and because neither Koos nor Zhou teach or suggest such a limitation, all of the limitations of claim 8 are not taught or suggested in the prior art relied upon by the Examiner. Therefore, under MPEP § 2143.03, a *prima facie* case of obviousness has not been established and the rejection of claim 8 under 35 U.S.C. 103(a) should be withdrawn.

4. Conclusion

For any or all of the foregoing reasons, it is respectfully submitted that the rejection of claim 8 as being obvious over Koos in view of Zhou has been successfully

traversed, and the Applicant respectfully submits that the rejection of claim 8 under 35 U.S.C. § 103 should be withdrawn.

Discussion Regarding Patentability of Claim 14

The Examiner has rejected claim 14 based upon the same modification of Koos and the same arguments discussed above with respect to claim 8. Claim 14 depends from claim 12 and includes all of the limitations of claim 12 as amended. Claim 14 thus recites DMSO as a nonaqueous solvent in a nonaqueous liquid. This is the same limitation discussed above with respect to claim 8. Accordingly, for any or all of the same reasons set forth above with respect to claim 12 and the additional reasons set forth above in paragraphs 2 and 3 of the discussion of claim 8, claim 14 is allowable over the prior art.

Discussion re: Claim 21

1. Claim 21

Claim 21, as amended, recites:

A method of fabricating a semiconductor wafer, comprising:

- (a) mixing an aqueous slurry containing an abrasive material and a nonaqueous solvent in a mixing unit so as to create a first volume of an aqueous slurry/nonaqueous solvent mixture with a first weight % of said nonaqueous solvent prior to being disposed onto said semiconductor wafer;
- (b) disposing the first volume of the aqueous slurry/nonaqueous solvent mixture containing an abrasive material onto said semiconductor wafer;
- (c) polishing the semiconductor wafer with a polishing pad using the first volume;
- (d) mixing the aqueous slurry containing an abrasive material and the nonaqueous solvent in a mixing unit so as to create a second volume of an aqueous slurry/nonaqueous solvent mixture having a greater weight % of said nonaqueous solvent than the first weight % prior to being disposed onto said semiconductor wafer;
- (e) disposing the second volume of the aqueous slurry/nonaqueous solvent mixture containing an abrasive material onto said semiconductor wafer; and
- (f) polishing the semiconductor wafer using the second volume.

Claim 21 thus recites that two slurry mixtures having different weight percent compositions of a nonaqueous solvent mixed with an aqueous slurry are used to polish the semiconductor wafer.

2. The Rejection of Claim 21 Has Been Overcome

The Examiner rejected claim 21 based primarily upon Koos with additional reference to U.S. Patent No. 5,985,045 to Kobayashi ("Kobayashi") for teaching a mixer section. (Office Action at page 7). As an initial matter, while the Applicant does not agree with the rationale used by the Examiner for the combination of Koos and Kobayashi, the Applicant has amended claim 21 to include limitations which, as discussed below, are not taught or suggested by Koos or Kobayashi. Therefore, the Applicant respectfully submits that the rejection of claim 21 has been overcome.

3. The Prior Art Does Not Teach or Suggest A Varied Mixture

Claim 21, as amended, recites two slurry mixtures having different weight percent compositions of a nonaqueous solvent mixed with an aqueous slurry and used to polish the semiconductor wafer. This limitation is similar to the limitation of claim 5 (now canceled) with respect to the variation in weight percent of nonaqueous solvent mixed with an aqueous slurry. The Examiner acknowledged with respect to claim 5 (now canceled) that the cited art failed to teach varying the concentration of the nonaqueous solvent in the mixture. (Office Action at page 7). Accordingly, the Applicant respectfully submits that the prior art cited by the Examiner does not teach all of the limitations of claim 21.

3. The Rejection of Claim 5 Does Not Apply to Claim 21

In the rejection of claim 5, the Examiner stated that “it would have been obvious ... to use a known method of increasing the concentration of a solvent for the purpose of removing residual slurry from the substrate” citing to Koos at column 6, lines 8-12. (Office Action at page 8). In the event the Examiner would consider using the same argument with respect to claim 21, the Applicant respectfully submits that such an argument cannot be relied upon for a rejection of claim 21 as amended.

a. No Known Method of Increasing Concentration Has Been Identified

As an initial matter, the Examiner did not identify any known method of increasing the concentration of a solvent during polishing. Therefore, since neither Koos nor Kobayashi teach such a limitation, and since the Examiner has not identified any prior art of record that teaches such a limitation, it is respectfully submitted that the prior art of record does not teach or suggest changing the concentration of a solvent during polishing.

Accordingly, because there is no evidence of a known method of increasing concentration of a nonaqueous solvent mixed with an aqueous slurry, the Applicant respectfully submits that the rejection of claim 5 under 35 U.S.C. § 103 does not apply to claim 21 as amended. (See MPEP § 2144.03, Citing to *Zurko*, 258 F.3d at 1385, 59 USPQ2d at 1697 (“[T]he Board cannot simply reach conclusions based on its own understanding or experience-or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings.”)).

b. There Is no Motivation For A Modification of Koos or Kobayashi

Moreover, the motivation proposed for the modification of Koos and Kobayashi is not convincing. Specifically, the motivation proposed by the Examiner is “for the purpose of removing residual slurry from the substrate”. (Office Action at page 7). The problem with the proposed motivation as applied to claim 21 is that claim 21 recites disposing additional slurry on the substrate. Obviously, if one of ordinary skill in the art desired to remove the residual slurry, she would not introduce *additional* slurry.

Therefore, the line of reasoning presented in the rejection of claim 5 is at least counter-intuitive, if not illogical when applied to claim 21, as amended. In either case, the line of reasoning is not, and cannot be, convincing as required by MPEP § 2144. Accordingly, it is respectfully submitted that claim 21, as amended, should not be rejected based upon the same reasoning used to reject claim 5.

4. Conclusion

For any or all of the foregoing reasons, it is respectfully submitted that the rejection of claim 21 as being obvious over Koos in view of Kobayashi has been overcome and the basis for rejecting claim 5 cannot be used to reject claim 21, as amended. Accordingly, the Applicant respectfully submits that the rejection of claim 21 under 35 U.S.C. § 103 should be withdrawn.

Discussion Regarding Patentability of Claim 6

The Examiner has rejected claim 6 based upon the same modification of Koos and Kobayashi and the same arguments discussed above with respect to claim 21. Claim 6 depends from claim 21 by way of claim 23 and includes all of the limitations of claim 21 as amended. Therefore, claim 6 is allowable over the prior art for at least the same reasons set forth above with respect to claim 21.

IV. Claims 9-11, 13 and 15-17 Have Been Deemed Allowable

The Examiner deemed the subject matter of claims 9-11, 13 and 15-17 to be allowable over the prior art. The Examiner objected, however, to those claims as being dependent upon a rejected base claim. As discussed above, claims 1 and 12, from which all of the claims 9-11, 13 and 15-17 depend, are allowable over the prior art. As a consequence, it is respectfully submitted that the objection to claims 9-11, 13 and 15-17 should be withdrawn.

V. Claims 22-25

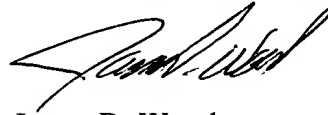
New claims 22-25 have been added. These claims recite novel and non-obvious limitations. Accordingly, claims 22-25 are believed to be allowable over the prior art.

VI. Conclusion

Applicant respectfully requests entry of the amendments and favorable consideration of the application.

A prompt and favorable action on the merits is requested.

Respectfully Submitted,



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